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Use of video system and its effects on abnormal behaviour in captive Japanese macaques (*Macaca fuscata*)

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ABSTRACT

Although nonhuman primates have highly developed visual cognitive abilities, they have few opportunities to exert such abilities in captivity. Video presentation can reproduce multiple features of the complex, real, visual world. Therefore, video presentation can be expected to act as environmental enrichment for captive primates. The present study evaluated the enriching effects of novelty and content of videos as well as control over videos using newly developed technology including network-shared YouTube videos and an infrared distance sensor. Baseline data were obtained for 10 days without video display and then 10 days with the display showing no videos in four individually housed monkeys and six pair-housed monkeys. The monkeys were then exposed to videos of conspecifics, people, and animation and observed for 30 days. In some days, the monkeys had control over videos such that videos played only when subjects sat directly in front of the display. Observations were then taken for an additional 10 days with no videos. Behaviours such as time watching videos, abnormal behaviour and time spent in front of display were recorded for 60 min per day using instantaneous sampling with a 30-s interval. Monkeys displayed fewer abnormal behaviours when the video was playing (individually housed: 11.3 sampling points, pair-housed: 7.7 sampling points) than when the video was not playing (individual housed: 22.5 sampling points, pair-housed: 10.8 sampling points) ($P < 0.001$). The abnormal behaviour over the course of the observation days showed no evidence of habituation to videos. The frequency of watching the videos and abnormal behaviour differed depending on the presented contents of videos ($P < 0.001$). The subjects spent more time in front of the display in the days in which they could control the videos (individually housed: 89.1 sampling points, pair-housed: 17.6 sampling points) than in those in which they had no control (individually housed: 70.1 sampling points, pair-housed: 7.3 sampling points) ($P < 0.001$), suggesting that they were preferentially choosing to watch the videos. These results suggest that video presentation can be a useful technique to decrease abnormal behaviour of captive Japanese macaques. The content and controllability over videos were influential on their behaviour, suggesting that implementation of video enrichment that includes conspecifics videos and controllability over videos can improve animal welfare. Implementation based on an understanding of species-specific characteristics can contribute to effective environmental enrichment.

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1. Introduction

1.1. Video presentation as environmental enrichment for captive nonhuman primates

Environmental enrichment can be implemented in various forms (Bloomsmith et al., 1991). The decision about which environmental enrichment is optimal depends on the species-specific characteristics of the animals (Kreger et al., 1998). Since primates have highly developed visual cognitive abilities, video presentation is widely used to provide sensory and cognitive enrichment for primates in research facilities (Reinhardt, 2010) and zoos (Clay et al., 2011). Some previous studies investigated the effect of video presentation on the welfare of captive primates. Platt and Novak (1997) showed that rhesus macaques became more active as a result of video stimulation. The monkeys engaged in behaviours related to exploration of the environment more frequently during video stimulation. In chimpanzees, television can attract the animals' interest even after 2 years of exposure (Brent and Stone, 1996). Individually housed chimpanzees were more likely to attend to video presentations than socially housed chimpanzees (Bloomsmith and Lambeth, 2000). Even in a zoo setting, video presentation can still be useful. Silverback western lowland gorillas spent much time watching a monitor when it displayed videos (Maloney et al., 2011). These studies indicated that video presentation may be a useful enrichment technique for captive primates.

Although video enrichment has been shown to have some effect on the welfare of primates, its ability to be adjusted to species-specific needs remains to be tested. In the present experiment, key components affecting the enriching effect of videos, such as the novelty and contents of videos and the controllability over videos, were examined by using newly developed technology.

1.2. Novelty and contents of videos

Novelty and contents have been studied as key properties of videos that might affect animals' preference in some previous studies. It is well known that animals become habituated to sensory stimuli that are presented repeatedly and dishabituated to new stimuli (e.g., Koba and Izumi, 2008; Murai et al., 2004; Quinn et al., 2002). Captive primates rapidly become habituated to videos that are presented repeatedly (Bloomsmith and Lambeth, 2000; Lee et al., 2011; Ogura and Matsuzawa, 2012; Platt and Novak, 1997). Novelty affects the attractiveness of videos, and therefore might influence their effect as environmental enrichment for primates. In other words, animals might prefer to watch novel videos than familiar ones.

The content of visual stimuli has also been found to affect the preference of primates. In cognitive studies, bonnet macaques (Andrews and Rosenblum, 2001; Brannon et al., 2004) and rhesus macaques (Washburn et al., 1997) preferred to watch videos with particular contents over other videos. Despite the consistent results from these cognitive studies, other studies examining the effect of contents on behaviour have had mixed results. While some studies (Bloomsmith and Lambeth, 2000; Maloney et al., 2011; Platt and Novak, 1997) found that videos that were supplied as visual enrichment did not affect the behaviour, another study (Ogura and Matsuzawa, 2012) found that videos with varying content did differentially affect the behaviour in Japanese macaques. Thus, the effects of the contents of visual stimuli have not been entirely consistent in enrichment compared to cognitive studies.

The present study investigated the effects of novelty and content of videos on the welfare of captive Japanese macaques. To supply a large number of novel videos showing various contents, this study tested the use of videos shared on the Internet by anonymous people.

1.3. Controllability over videos

How the video is presented may also affect its usefulness as enrichment. Many studies have found that having control over the environment is important for monkeys. In Washburn et al. (1991), rhesus monkeys performed significantly better on computer tasks they selected compared to identical tasks assigned by the experimenter. Hanson et al. (1976) found that rhesus monkeys that had control over a high-intensity noise had significantly lower plasma cortisol concentrations than monkeys exposed to identical amounts of high-intensity noise but without any control. Another phenomenon is contrafreeloading, which experimentally evaluates the value of control as well as reward that can be obtained as a result of control (Inglis et al., 1997; Sambrook and Buchanan-Smith, 1997). This phenomenon was confirmed by using a visual reward (Ogura, 2011) as well as a food reward (Menzel, 1991; Reinhardt, 1994) in primates. These studies provided empirical evidence of the value of control over the environment for primates.

To make it easy for monkeys to understand a contingency between their behaviour and videos, this study used a new technique that allowed the monkeys to control videos by altering their location in their cage.

2. Methods

2.1. Subjects

The subjects were 10 adult Japanese macaques living at the Primate Research Institute of Kyoto University. Two of the subjects were individually housed males, each 11 years of age, two were individually housed females, 10 and 13 years of age, and the other six were housed in three, male–female pairs. The ages of the pair-housed subjects were not known because they were born in the wild, but they were fully matured. The individually housed subjects had been maintained in cages (80 cm high × 80 cm wide × 60 cm long) for more than 2 years. Because of limitations of available space, the subjects could not see other monkeys during this study. The pair-housed subjects were maintained in cages (200 cm high × 137 cm wide × 115 cm long) that allowed them to see other monkeys in the same room. All subjects were habituated to the observer for at least 2 weeks before the start of observations. The monkeys were fed monkey pellets and sweet potatoes daily at about 10:00 h and 17:00 h and had access to water ad libitum. Routine care of the monkeys and experiments were